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lying upon the shore a cut of a large fir-tree, of about 2½ foot diameter and 9 or 10 foot long, which had lain so long out of the water that it was very dry; and most of the shells that had formerly covered it were worn or rubbed off. Only on the parts that lay next the ground there still hung multitudes of little shells, having within them little birds perfectly shaped. . . . The shells hang on the tree by a neck longer than the shell; of a kind of filmy substance, round and hollow, and creased, not unlike the windpipe of a chicken, spreading out broadest where it is fastened to the tree, from which it seems to draw and convey the matter which serves for the growth and vegetation of the shell, and the little bird within it. . . . This bird in every shell that I opened, as well the least as the biggest, I found so curiously and completely formed that there appeared nothing wanting as to the internal parts for making up a perfect sea-fowl; every little part appearing so distinctly that the whole looked like a large bird seen through a concave or diminishing glass, color and feature being everywhere so clear and neat. The little bill like that of a goose, the eyes marked, the head, neck, breast, wings, tail, and feet formed, the feathers everywhere perfectly shaped and blackish colored, and the feet like those of other water-fowl to my best remembrance."

Such was the old belief existing during five centuries, at any rate, and probably accepted at periods both earlier and later than those from which the preceding examples are taken. To modern observers it seems utterly absurd. Science has shown its absolute groundlessness as natural history; and Professor Max Müller, to complete the rout, has put forward, in his "Lectures on the Science of Language," a very interesting theory of its probable origin from the point of view of philology. But the latest researches have shown that the barnacle has been deposed from his place in a mythical metamorphosis, only to take part in his life-history as now ascertained in another transformation scene quite as wonderful, and this time vouched by the careful observations of our best naturalists.

In the adult state, Mr. Seville goes on to say, the barnacle consists of a shell-fish permanently attached, by a fleshy peduncle or stalk, to a piece of timber or rock or some other object in the sea. The shell opens by a peculiar valve-like arrangement, and, through the aperture thus formed, several pairs of long, many-jointed "cirri," or feelers, are put forth, which, by their constant waving motion, whirl to the creature's mouth the small particles which form its food. Huxley's description is concise and expressive: "A crustacean fixed by its head, and kicking the food into its mouth with its legs." It is not the change of this creature into a goose that science can now surprise us with: that story must be given up along with the accounts of griffins, phoenixes, and dragons. The fruit theory as to its origin must also be abandoned; but, though the new account does not involve quite so violent a transition as that from the vegetable to the animal kingdom, it is still in the steps by which the adult form is reached that those changes are revealed which almost entitle the barnacle to the reputation for facile metamorphosis with which our forefathers credited it. The steps in question are (besides the egg) the two stages known respectively as the *Nauplius* and *Cypris* stages. Immediately on its escape from the egg, the young barnacle appears as an animal of microscopic size, active and free-swimming, equipped with a broad shell or shield on its back, and having three pairs of legs, a single eye, a mouth, and a forked tail. This is the *Nauplius*, and in outward appearance the young creature exhibits at this stage no single point of resemblance to the parent form. It feeds and grows apace, and moults several times. It then enters the next condition of its existence, — the *Cypris* stage. The broad shield-shaped carapace becomes folded together, somewhat after the pattern of a bivalved shell, and almost encloses its owner. The foremost limbs are transformed into a very peculiar pair of suctorial or adherent feelers, and the two hinder pairs are cast off, their place being taken by six pairs of powerful swimming-legs with bifid extremities. A pair of compound eyes is another new feature of this stage; and altogether the *Cypris*, while still quite distinct from the adult barnacle, presents a very different appearance from the *Nauplius*. The mouth is wanting, or at least is functionless, being covered by an integument without aperture. Existence in this stage is therefore necessarily short, and the

Cypris soon fixes upon its future abode by attaching itself by its suctorial feelers to some piece of drift-wood, pile, or rock. A kind of cement, which it secretes by means of special glands, pours out round the base of attachment, and quickly hardens, gluing the ends of the feelers firmly to the surface on which they rest. The compound eyes are shortly afterwards moulted, the body straightens out, and the shell thus comes to stand almost perpendicularly to the surface of attachment. Other changes follow: the shape of the shell is modified, and the position of the animal within alters in such a manner that the under surface of its body is turned directly away from the point of attachment; the integument covering the mouth is cast off; the legs cease all swimming ambulatory functions, and soon become mere cirri, sweeping the water for prey; the feelers are gradually covered with a fleshy pulp, and, losing all trace of their old form, are converted into a single stalk of attachment; the new parts of the shell which are to form the valvular opening, and other protecting plates, begin to form, and, for all practical purposes, the barnacle, though still very minute, has attained its adult form, future development being mainly in the matter of size.

The old legend involved a double change from fruit to fish, and from fish to bird; the new history also deals with a double change, from *Nauplius* to *Cypris*, and from *Cypris* to barnacle. For one series of wonders another has been substituted, and, if this is not sufficient to restrain us from too hastily condemning our forefathers' credulity, it will be well to remember how recently we have arrived at the truth. Little more than fifty years ago the position of the barnacle in the animal kingdom was still completely unsettled. Agreeing in most of its outward characteristics with the *Mollusca*, it was commonly classed with them. The *Nauplius* and *Cypris* were not connected with the parent form, but, if described at all, were treated as distinct animals. In 1830 J. Vaughan Thompson's description of his observations of their metamorphoses cast a new light on the subject; but the question still remained somewhat open ground for naturalists, and it was not until 1851-53 that Darwin, in his "Monograph of the Cirripedia," definitely settled the barnacle's claim to be classed with the *Crustacea*, and established beyond dispute the facts of its complicated and peculiar life-history.

BOOK-REVIEWS.

The Development of the Philosophy of the Steam-Engine. By ROBERT H. THURSTON. New York, Wiley. 16°. 75 cents.

THIS historical sketch, which relates not only to the steam-engine, but also to the various heat-engines embodying the same principles, was originally prepared by Professor Thurston some five or six years ago, and was presented in the form of a paper to the British Association for the Advancement of Science in 1884, at its Montreal meeting. The paper was favorably received, and was incorporated in full in the association's "Transactions" of that year. Believing the time appropriate for the publication of such a sketch, he now gives it to the public in a more permanent and accessible form. Though the author does not hold that the theory of the steam-engine is yet in its final perfect and complete form, he believes that the main principles and essential facts of a complete theory are well determined and well recognized by advanced thinkers and intelligent practitioners. This view of the case, we think, will not be disputed; and all persons concerned in engine-designing will find this sketch of the development of the philosophy of the steam-engine a valuable guide in working out future improvements.

Oceania: Linguistic and Anthropological. By Rev. D. MACDONALD. Melbourne, M. L. Hutchinson; London, Sampson Low. 16°.

THE author takes the stand that the ancient Oceanic mother-tongue was a branch of the Semitic family, and that while, like the other languages of this stock, it had much in common with all the rest of phonetics, grammar, and vocabulary, it had certain peculiarities, and that therefore the modern Oceanic dialects are Neo-Semitic, "somewhat as Modern Syriac." The author compares Malagassy, Malay, Efatese, and Samoan with many Semitic dialects, and calls his new family Semitic-Oceanic. The author can hardly claim to have succeeded in proving such a relationship.